Trend of Stunting Cases related to Increased Access to Sanitation and Antenatal Care Visits: Correlation Study in Lampung, Indonesia

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Abstract: Significant progress has been made globally in reducing chronic malnutrition and stunted linear growth among children under the age of 5, though rates remain high in many regions. Policies, programs, and interventions supporting maternal and child health and nutrition hold potential to enhance child growth and development. Although cases have declined in Indonesia over the past decade, the trend in Lampung Province remains unclear. This article aims to illustrate the trend of stunting cases in Lampung Province and determine whether this trend correlates with increased access to Antenatal Care (ANC) and improved sanitation. We collected data from the Basic Health Research (Riskesdas) surveys conducted between 2007 and 2022. The data were then analyzed, and a correlation test was conducted to assess the relationship between the stunting trend, ANC visits, and sanitation improvements. Stunting cases across each district showed a decline; however, between 2007 and 2013, there was an increase in three districts: Central Lampung, Bandar Lampung City, and Metro City. Another increase was observed in Way Kanan district between 2013 and 2018. Nevertheless, each district managed to achieve a significant reduction in cases by 2022. The correlation test results indicate that the reduction in stunting cases in Lampung Province is associated with increased ANC visits and improved sanitation access. Enhancing the coverage of ANC services and improving sanitation conditions are closely associated with a decrease in stunting prevalence. ANC access has a stronger correlation with the reduction in stunting rates than sanitation, though both are significant factors influencing stunting prevalence.

Keywords: Stunting, Antenatal, Sanitation

INTRODUCTION

One of the global issues hindering human development is stunting, a condition where children have a height lower than their age standard due to chronic malnutrition. Stunting, which can occur from pregnancy until the child reaches 24 months, is a form of growth failure caused by long-term nutritional deficiencies (Suratri et al., 2023). Short-term malnutrition can increase the risk of disease and death, as well as affect a child's development in terms of cognition, motor skills, and language. Additionally, the cost of caring for and treating sick children will increase, adding a greater economic burden.

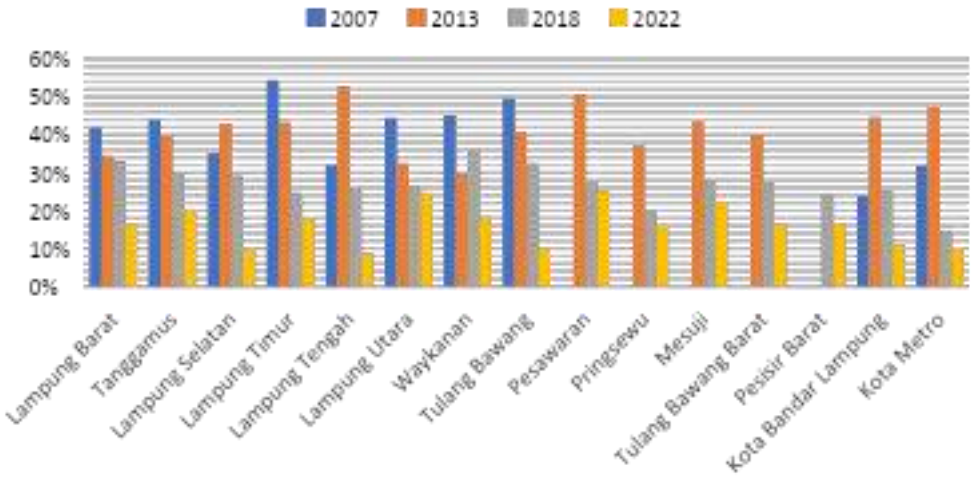
In the long term, malnutrition affects reproductive health, learning abilities, and reduces work productivity. On a broader scale, children who experience stunting tend to grow into adults with lower levels of education, live in poverty, face health issues, and are more vulnerable to non-communicable diseases such as obesity and cardiovascular diseases. Ultimately, this can lead to economic losses for the country (Suratri et al., 2023). Stunting can be prevented by meeting the nutritional needs of children during the first 1000 days of life, ensuring adequate nutrition for pregnant women, providing sufficient protein for toddlers aged over 6 months, maintaining proper sanitation, and ensuring access to clean water. Regular check-ups at the local health post (Posyandu) at least once a month are also crucial (BPS, 2018; MCA Indonesia, 2013). Furthermore, research by Fadlyana et al. (2020) found that mothers who attended less than four antenatal care (ANC) visits during pregnancy had a higher risk of giving birth to children with stunting. This study highlights the importance of regular ANC visits to monitor fetal health and prevent stunting through proper nutritional oversight. A study by the International Journal of Public Health (2021) also found that mothers who attended more than four ANC visits during pregnancy had children with a lower risk of stunting. Factors such as iron supplementation and nutrition education during ANC visits play a key role in preventing stunting. Globally, stunting rates have declined in recent decades, but there are still around 144 million children suffering from stunting worldwide, or about 22% of the global population of children under five years old (WHO, 2014). South Asia and Sub-Saharan Africa have the highest stunting rates in the world, with around 35-40% of children under five experiencing stunting in these regions, especially in countries like India, Pakistan, Nigeria, and the Democratic Republic of Congo. South Asia alone accounts for nearly 55% of global stunting cases. In Indonesia, the national stunting rate is 21.6%, down from 24.4% in 2021. Despite this decline, stunting remains a significant challenge in several provinces. The highest prevalence is in East Nusa Tenggara (35.3%) and the lowest is in Bali (8%). In Lampung Province, the stunting prevalence is 15.2%, which is below the national average. Stunting data in Lampung in 2022 shows that it is below the national average, but questions remain about the trends in previous years and whether these trends are related to ANC visits and improved access to sanitation. This study aims to examine the trend of stunting in Lampung Province from 2007 to 2022, and whether it is related to ANC visits and improved sanitation access.

METHOD

We collected data from the Basic Health Research (Riskesdas) from 2007 to 2022. The data was then analyzed to observe the trend of stunting cases over the years, followed by a correlation pearson test to determine whether the observed trends were related to ANC visits and improvements in sanitation.

RESULTS

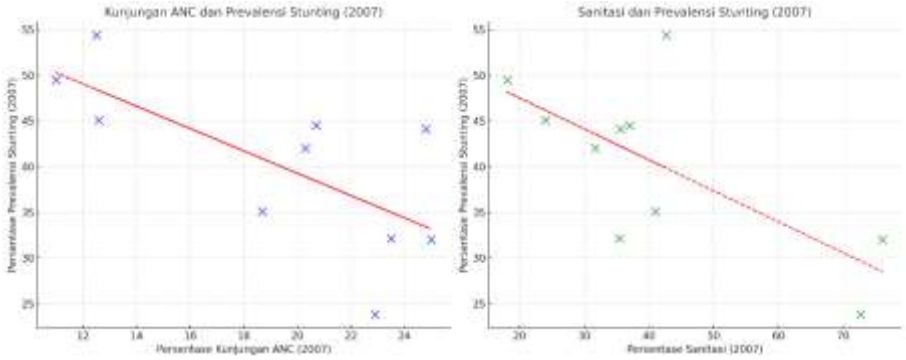
The graph shows the trend of stunting prevalence in several regencies/cities in Lampung Province at four different time points: 2007, 2013, 2018, and 2022.



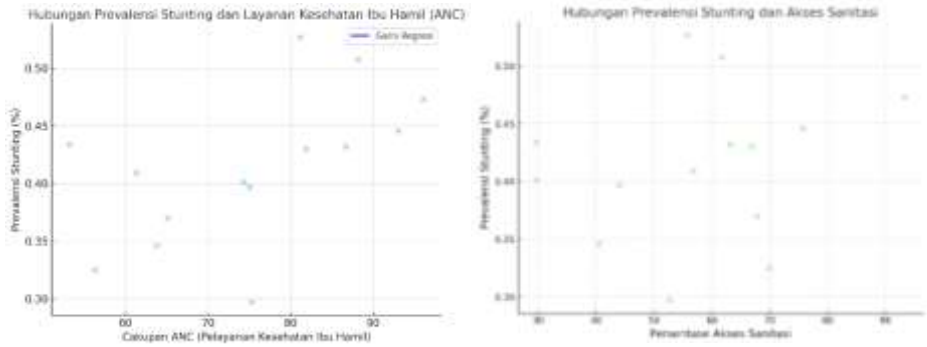
Picture 1. Stunting Trends in Lampung Province 2007-2022

The results show variations across regencies/cities. Waykanan Regency and North Lampung had high stunting prevalence in 2007 and 2013, but saw a dramatic decline by 2022. Pringsewu initially experienced fluctuations but also showed a significant decrease in 2022. Some areas, such as Bandar Lampung City and Metro City, consistently had lower stunting prevalence from the beginning, with only minor changes over the years. This graph illustrates that most regions in Lampung have successfully reduced stunting prevalence, especially in the past decade, with notable improvements in 2022. These findings reflect the positive impact of government nutrition and health intervention programs in the region.

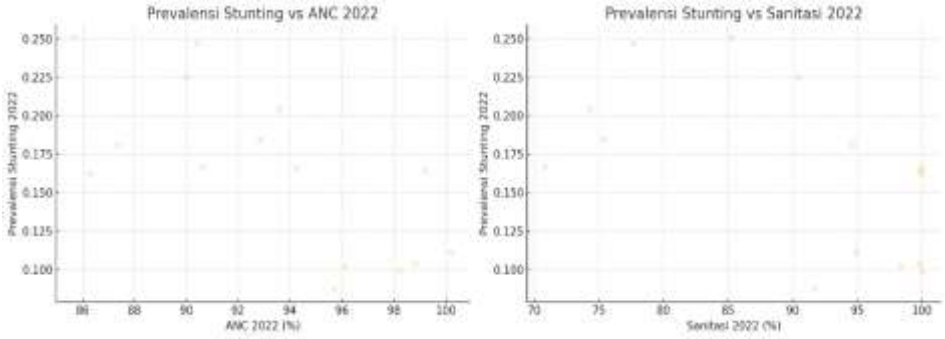
Correlation Test of Stunting with ANC and Sanitation 2007, 2013 and 2022



Picture 2. Results 2007



Picture 3. Results 2013



Picture 4. Results 2022

Correlation Test for 2007

The visualization above shows a negative relationship, where as the percentage of ANC (Antenatal Care) visits increases, the prevalence of stunting tends to decrease. The correlation coefficient is -0.70 with a p-value of 0.023. This result indicates a statistically significant negative relationship between stunting prevalence and ANC visits. In other words, the higher the percentage of ANC visits, the lower the stunting prevalence. The second diagram illustrates how sanitation

conditions may correlate with stunting prevalence, where increased access to sanitation could be related to a decrease in stunting. The correlation coefficient is -0.69 with a p-value of 0.027. This also shows a statistically significant negative relationship, indicating that better sanitation conditions are associated with lower stunting prevalence.

Correlation Test for 2013

The data visualization shows that the relationship between stunting prevalence and maternal healthcare services (ANC) indicates that better ANC coverage tends to be associated with lower stunting rates. With a correlation coefficient of 0.566 and a p-value of 0.034, this suggests a significant correlation between stunting prevalence and ANC. Therefore, it can be concluded that the higher the ANC visits, the lower the stunting prevalence. Furthermore, the correlation between stunting prevalence and access to sanitation shows that sanitation access does not greatly affect stunting levels, although there is a slight relationship. With a correlation coefficient of 0.222 and a p-value of 0.445, it can be concluded that there is no significant correlation between stunting prevalence and sanitation conditions.

Correlation Test for 2022

The correlation test results indicate that the prevalence of stunting and ANC in 2022 shows a tendency that the higher the ANC coverage, the lower the stunting prevalence. This suggests that good access to maternal healthcare services can contribute to reducing stunting rates. The correlation between ANC and stunting prevalence has a p-value of 0.003, which indicates that this correlation is statistically significant ($p < 0.05$). This means that the negative relationship between ANC coverage and stunting prevalence is not due to chance. Furthermore, the stunting prevalence and sanitation in 2022 indicate that better sanitation access is associated with lower stunting prevalence. This highlights the importance of proper sanitation in stunting prevention efforts. The correlation between sanitation and stunting prevalence has a p-value of 0.034, which also indicates that the correlation is statistically significant ($p < 0.05$). This suggests that better sanitation is indeed related to lower stunting prevalence. Both relationships are significant, with ANC having a stronger association with the reduction of stunting prevalence compared to sanitation.

DISCUSSION

1. Relationship Between ANC and Stunting Prevalence

From 2007 to 2022, the data continuously shows a strong correlation, indicating that the higher the coverage of ANC services, the lower the stunting prevalence tends to be. Better access

to healthcare services during pregnancy, such as health check-ups, supplementation, and nutritional education, plays a crucial role in preventing conditions that may lead to stunting in children. According to research conducted by Tyler et al. in 2022, access to healthcare services (ANC) also contributes substantially to improving child growth, although the extent of variation explained differs between countries (Vaivada et al. 2020). Research conducted by Nugroho et al. in 2023 shows that healthcare services are one of the indirect causes of stunting. Healthcare services are one of the measures in efforts to reduce malnutrition rates. Nutritional issues in healthcare services include immunization, child weighing, pregnancy check-ups (Antenatal Care), and facilities such as integrated health posts (posyandu) and community health centers (puskesmas). Antenatal Care (ANC) is often referred to as pregnancy check-ups. The frequency of ANC visits is one of the risk factors for stunting in children, as routine ANC visits can help detect pregnancy risks early, particularly those related to nutritional problems. Efforts to increase ANC coverage through maternal and child health programs are crucial. Policies to expand access to healthcare services, especially in areas with low ANC coverage, could significantly impact reducing stunting rates (Nugroho et al. 2023).

2. Relationship Between Sanitation and Stunting Prevalence

From 2007 to 2022, the data shows a correlation, although the relationship between stunting prevalence and sanitation access in 2013 indicated that sanitation access did not greatly affect stunting rates, despite a slight relationship. With a correlation coefficient of 0.222 and a p-value of 0.445, it can be concluded that there was no significant relationship between stunting prevalence and sanitation conditions. However, in 2022, a strong correlation (-0.55) was observed between sanitation and stunting prevalence, with a p-value of 0.034, which is also statistically significant. This correlation indicates that areas with better sanitation conditions have lower stunting prevalence. Proper sanitation, such as access to clean toilets and safe water, can prevent gastrointestinal infections that are often the cause of malnutrition and stunting in children. Improving access to proper sanitation is a crucial step to support public health, especially for children. Programs to improve sanitation infrastructure, hygiene education, and good environmental management must be continuously strengthened. Research conducted by Zhihui et al. in 2020 titled Impact of Sanitation on Child Stunting in Low- and Middle-Income Countries found that access to adequate sanitation, such as safe toilet use and good waste management, is associated with a reduced risk of stunting in children. Poor sanitation increases children's exposure to pathogens that

can cause intestinal infections, contributing to malnutrition and stunting. Improving access to sanitation can reduce infection rates and enhance children's overall nutritional status.

CONCLUSION

The analysis results show that the increase in maternal healthcare coverage (ANC) and the improvement of sanitation conditions are closely related to the reduction in stunting prevalence. ANC has a stronger relationship compared to sanitation, but both are significant in influencing children's health and nutritional status. Therefore, integrated efforts to strengthen healthcare and sanitation services are crucial for effectively addressing the issue of stunting. Based on the results of the correlation analysis between ANC coverage, sanitation, and stunting prevalence, the following policy recommendations can be implemented to reduce the prevalence of stunting:

1. Improving Access and Quality of ANC (Antenatal Care) Services a) Policy: Expand ANC access, especially in areas such as Pesawaran district with low coverage, through the development of healthcare facilities, provision of healthcare workers, and mobile clinic services.
   a) Education Program: Enhance educational programs for pregnant women about the importance of ANC, nutrition during pregnancy, and maternal and child healthcare.
   b) Service Innovation: Utilize technology, such as health applications or telemedicine, to reach pregnant women who have difficulty accessing physical healthcare facilities.
   c) Incentive Program: Provide incentives such as nutritional assistance or free check-ups for pregnant women who regularly attend ANC.
2. Improving Access and Quality of Sanitation
   a) Infrastructure Development: Accelerate the development of sanitation infrastructure, such as access to clean water and proper toilets, especially in rural areas or densely populated settlements
   b) Sanitation Education**:** Launch educational campaigns on clean and healthy living behaviors (PHBS), such as the importance of handwashing with soap, maintaining a clean environment, and proper toilet use.
   c) Sanitation Subsidies**:** Provide subsidies or assistance for the construction of sanitation facilities in low-income households, so more families can have access to proper sanitation faciliti

Conflict of Interest

The authors hereby declare that there are no conflicts of interest related to the research, writing, or publication of this journal. All processes were carried out independently and objectively without any influence from specific parties.

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